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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/811,607	03/29/2004	Sang Hun Lee	42P19028	2832

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INTEL CORPORATION
c/o INTELLEVATE, LLC
P.O. BOX 52050
MINNEAPOLIS, MN 55402

EXAMINER

NGUYEN, THONG Q

ART UNIT PAPER NUMBER

2872

DATE MAILED: 10/25/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/811,607

Applicant(s)

LEE ET AL.

Examiner

Thong Q. Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 April 2006 and 16 August 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 April 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. The present Office action is made in response to the amendments filed on 4/24/06 and 8/16/06.

It is noted that in the amendment of 4/24/06, applicant has amended the specification, the drawings and the claims. Regarding to the drawings, applicant has added a new set of figures 7A-D, and regarding to the claims, applicant has amended claims 1, 6-11 and 17-26. There is not any claimed being added or canceled from the application.

In the amendment of 8/16/06 in response to the Notice of non-compliant mailed to applicant on 7/11/06, applicant has corrected the changes to the specification. There is not any change to the claims and the drawings in the amendment of 8/16/06.

Drawings

2. The drawings contained four sheets of figures 7A-D were received on 4/24/06. These drawings are approved by the examiner. As a result of the addition of the four new figures, the application now contains eleven sheets of figures 1, 2A, 2B, 2C, 3A, 3B, 4, 5, 6, 7A, 7B, 7C and 7D.

Specification

3. The lengthy specification which was amended by the amendments of 4/24/06 and 8/11/06 has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

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4. The objection to the specification because it does not have a Summary of the invention as set forth in the previous Office action is now withdrawn.

In applicant's response, applicant's representative has stated their belief that the office improperly required a section identified as the "Brief Summary of the Invention" and has requested reconsideration of said requirement and thereby withdrawal of the objection.

As a side note, the Brief Summary of the Invention, (see MPEP § 608.01(d) and 37 CFR §§ 1.71 and 1.73) is a "summary [which] is separate and distinct from the abstract and is directed toward the invention rather than the disclosure as a whole. The summary may point out the advantages of the invention or how it solves problems previously existent in the prior art (and preferably indicated in the Background of the Invention. Further, 37 CFR § 1.73 states:

A brief summary of the invention indicating its nature and substance, which may include a statement of the object of the invention, should precede the detailed description. Such summary should, when set forth, be commensurate with the invention as claimed and any object recited should be that of the invention as claimed.

Since the purpose of the brief summary of invention is to apprise the public, and more especially those interested in the particular art to which the invention relates, of the nature of the invention, the summary should be directed to the specific invention being claimed, in contradistinction to mere generalities which would be equally applicable to numerous preceding patents. That is, the subject matter of the invention should be described in one or more clear, concise sentences or paragraphs.

Stereotyped general statements that would fit one application as well as another

serve no useful purpose and may well be required to be canceled as surplusage, and, in the absence of any illuminating statement, replaced by statements that are directly on point as applicable exclusively to the case at hand.

The brief summary, if properly written to set out the exact nature, operation, and purpose of the invention, will be of material assistance in aiding ready understanding of the patent in future searches. The brief summary should be more than a mere statement of the objects of the invention, which statement is also permissible under 37 CFR 1.73.

The brief summary of invention should be consistent with the subject matter of the claims.

It appears that though, "A Brief Summary of the Invention" might be a useful tool in understanding the subject matter in a printed patent, it is not a requirement set forth in the MPEP, and as such, the objection requiring applicant and/or their representative to correct the disclosure by adding a section entitled, "A Brief Summary of the Invention," is withdrawn.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 1-26 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

a) Claim 1 is indefinite by the recitation thereof "the structure comprising 36 bi-layers wherein Molybdenum has a thickness of 2.4 – 11.3 nm and Silicon has a thickness of 3.5 – 10.4 nm" (lines 3-5) is indefinite. It is noted that since the Molybdenum and Silicon are name of material, thus it is not understood why each mentioned material has a range of thickness as claimed.

b) Claim 4 is indefinite for the following reasons: First, the feature thereof "the relative phase shift" (lines 1-2) lacks a proper antecedent basis; and Second, the mentioned feature is indefinite because it is unclear about the mete/bound of the feature claimed.

c) Claim 11 is rejected under 35 USC 112, second paragraph for the similar reason as set forth in element a) above. In other words, the recitation thereof "the ML mirror comprising 36 bi-layers wherein Molybdenum has a thickness of 2.4 – 11.3 nm and Silicon has a thickness of 3.5 – 10.4 nm" (lines 8-10) is indefinite. It is noted that since the Molybdenum and Silicon are name of material, thus it is not understood why each mentioned material has a range of thickness as claimed.

d) Claim 15 is rejected under 35 USC 112, second paragraph for the similar reasons as set forth in element b) above.

e) Claim 20 is rejected under 35 USC 112, second paragraph for the similar reason as set forth in element a) above. In other words, the recitation thereof "the mirror comprising 36 bi-layers wherein Molybdenum has a thickness of 2.4 – 11.3 nm except for a thicker bi-layer 1 nearest substrate and Silicon has a thickness of

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3.5 – 10.4 nm except for thicker bi-layers 3, 5 and 15” (lines 7-10) is indefinite.

First, it is noted that since the Molybdenum and Silicon are name of material, thus it is not understood why each mentioned material has a range of thickness as claimed; second, the recitations related to the so-called “a thicker bi-layer 1 nearest substrate” (line 9) and the so-called “thicker layers 3, 5, and 15” (line 10) are indefinite. What does applicant mean by “bi-layer 1” (line 9) and “bi-layers 3, 5, and 15” (line 10)? What are the structural relationship among the mentioned bi-layers, the substrate and other layers of the mirror?

f) The remaining claims are dependent upon the rejected base claims and thus inherit the deficiencies thereof.

Claim Objections

7. Claims 5-7, 10, 16-18 and 23-25 are objected to because of the following informalities. Appropriate correction is required.

a) Claim 5 is unclear by the recitation thereof “the ML mirror comprises a 13.5 nm central wavelength” (lines 1-2). The mentioned recitation is unclear because it is unclear how a mirror comprises a wavelength. The Examiner is of opinion that the claim should be amended to recite that the ML mirror reflects light having a 13.5 nm wavelength.

b) Claim 6 is objected to for the similar reason as set forth in element a) above. In other words, it is unclear how a structure having a plurality of bi-layers provides a wavelength. The Examiner is of opinion that the claim should be amended to recite that the structure reflects light having a 13.5 nm wavelength.

- c) In claim 7: the phrase thereof "the bi-layers in the structure have a variable thickness" (lines 1-2) has a grammatical error. Should the mentioned phrase be changed to --each of the bi-layers in the structure has a variable thickness--?
- d) In claim 10: the phrase thereof "the additional bi-layers in the structure have a variable thickness" (lines 1-2) has a grammatical error. Should the mentioned phrase be changed to --each of the additional bi-layers in the structure has a variable thickness--?
- e) Each of claims 16 and 23 is objected to for the similar reason as set forth in element a) above. Should each claim be amended to recite that the ML mirror reflects light having a 13.5 nm wavelength?
- f) Each of claims 17 and 24 is objected to for the similar reason as set forth in element b) above. Should each claim be amended to recite that the structure reflects light having a 13.5 nm wavelength?
- g) In each of claims 18 and 25: the phrase thereof "the bi-layers have a variable thickness" (lines 1-2 of each claim) has a grammatical error. Should the mentioned phrase be changed to --each of the bi-layers has a variable thickness--?

Claim Rejections - 35 USC § 103

8. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

9. Claims 1-10, as best as understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Yakshin et al (EP 1348984, of record) in view of Montcalm et al (U.S. Patent No. 5,958,605).

Yakshin et al disclose an optical broad band element. The element as described in pages 3-4 and 6 and shown in figures 2 and 4-6 comprises a multilayer mirror for reflecting light in an extreme ultraviolet wavelength. In particular, the multilayer mirror comprises a substrate and a set of alternative layers formed on the substrate. See pages 2-3. Regarding to the range of angles which the mirror reflects with a uniform level and small phase shifts, the mirror as provided by Yakshin et al can provide a uniform reflection of extreme ultraviolet wavelength of 13.4 nm up to 20 degrees without a significant loss of reflectivity and change in phase shift. See pages 3 and 4, section [0032], for example. The multilayers formed on the substrate of the mirror as provided by Yakshin et al are constituted by Mo/Si bi-layers.

Regarding to the number of layers as recited in claim 1, it is noted that the claim recites the number of layers by an open language thereof "comprising", and further the number of layers is able to larger than 36 as can be seen in the dependent claims 8-9. In this aspect, it is noted that the number of layers as provided by Yakshin et al is about 100. See section [0029].

Regarding to the value of the loss in reflectivity as recited in present claim 3, such feature is read in the data provided in the figures 5 and 6 in comparison with the data provided in figure 4 of the present application. In other words, the

difference in reflectivity at the angle of 18 degrees and that of 20 degrees as shown in each of figures 5 and 6 is about 20 % which is closed to the value as provided in the figure 4 of the present application. The thickness of the layers as provided by Yakshin et al is able to change as can be seen in pages 3-4, section [0031], for example. It is noted that since a change in thickness will yield a change in optical characteristics including the change in the reflective level of the mirror, then it would have been obvious to one skilled in the art at the time the invention was made to modify the multilayer mirror as provided by Yakshin et al by adjusting the thicknesses of the layers to reduce the loss of the reflectivity of the mirror in a desired/particular range or value.

The only feature missing from the Mo/Si multilayered mirror provided by Yakshin et al is that they do not explicitly state the thickness of the Mo layers and the Si layers as claimed. However, the use of a Mo/Si multilayered mirror in an extreme ultraviolet or soft X-ray application wherein the thicknesses of the Mo layers and Si layers in the claimed ranges is known to one skilled in the art as can be seen in the system provided by Montcalm et al. In particular, Montcalm et al disclose a multilayered mirror having 40 to 100 alternative Mo/Si layers, column 3, lines 3-7, and teach that the thickness of the Mo layer is 2.8 nm and the thickness of the Si layer is 4.0 nm, see column 5, lines 2-4. It is also noted that a change in thickness of the Mo layers and Si layers is clearly disclosed by Yakshin et al as can be seen in section [0031]. Thus, it would have been obvious to one skilled in the art at the time the invention was made to modify the Mo/Si multilayered mirror

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as provided by Yakshin et al by Mo layers having thickness of 2.8 nm and Si layers having thickness of 4.0 nm as suggested by Montcalm et al and varying the thicknesses of the layers as disclosed by Yakshin et al for the purpose of increasing the reflectivity intensity and maintaining the stability of the mirror.

10. Claims 11-19, as best as understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Yakshin et al (EP 1348984, of record) in view of Montcalm et al (U.S. Patent No. 5,958,605) and Mann et al (Pub. US 2003/0099034, of record).

Yakshin et al disclose an optical broad band element. The element as described in pages 3-4 and 6 and shown in figures 2 and 4-6 comprises a multilayer mirror for reflecting light in an extreme ultraviolet wavelength. In particular, the multilayer mirror comprises a substrate and a set of alternative layers formed on the substrate. See pages 2-3. Regarding to the range of angles which the mirror reflects with a uniform level and small phase shifts, the mirror as provided by Yakshin et al can provide a uniform reflection of extreme ultraviolet wavelength of 13.4 nm up to 20 degrees without a significant loss of reflectivity and change in phase shift. See pages 3 and 4, section [0032], for example. The multilayers formed on the substrate of the mirror as provided by Yakshin et al are constituted by Mo/Si bi-layers.

Regarding to the number of layers as recited in claim 11, it is noted that the claim recites the number of layers by an open language thereof "comprising", and further the number of layers is able to larger than 36 as can be seen in the

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dependent claims 8-9. In this aspect, it is noted that the number of layers as provided by Yakshin et al is about 100. See section [0029].

Regarding to the value of the loss in reflectivity as recited in present claim 3, such feature is read in the data provided in the figures 5 and 6 in comparison with the data provided in figure 4 of the present application. In other words, the difference in reflectivity at the angle of 18 degrees and that of 20 degrees as shown in each of figures 5 and 6 is about 20 % which is closed to the value as provided in the figure 4 of the present application. The thickness of the layers as provided by Yakshin et al is able to change as can be seen in pages 3-4, section [0031], for example. It is noted that since a change in thickness will yield a change in optical characteristics including the change in the reflective level of the mirror, then it would have been obvious to one skilled in the art at the time the invention was made to modify the multilayer mirror as provided by Yakshin et al by adjusting the thicknesses of the layers to reduce the loss of the reflectivity of the mirror in a desired/particular range or value.

The only feature missing from the Mo/Si multilayered mirror provided by Yakshin et al is that they do not explicitly state the thickness of the Mo layers and the Si layers as claimed. However, the use of a Mo/Si multilayered mirror in an extreme ultraviolet or soft X-ray application wherein the thicknesses of the Mo layers and Si layers in the claimed ranges is known to one skilled in the art as can be seen in the system provided by Montcalm et al. In particular, Montcalm et al disclose a multilayered mirror having 40 to 100 alternative Mo/Si layers, column 3, lines 3-7,

and teach that the thickness of the Mo layer is 2.8 nm and the thickness of the Si layer is 4.0 nm, see column 5, lines 2-4. It is also noted that a change in thickness of the Mo layers and Si layers is clearly disclosed by Yakshin et al as can be seen in section [0031]. Thus, it would have been obvious to one skilled in the art at the time the invention was made to modify the Mo/Si multilayered mirror as provided by Yakshin et al by Mo layers having thickness of 2.8 nm and Si layers having thickness of 4.0 nm as suggested by Montcalm et al and varying the thicknesses of the layers as disclosed by Yakshin et al for the purpose of increasing the reflectivity intensity and maintaining the stability of the mirror. The combined product as provided by Yakshin et al and Montcalm et al does not clearly state that the extreme ultraviolet or soft X-ray application contains a plurality of mirrors as claimed. However, the use of a multilayered mirror in an extreme ultraviolet application having a plurality of mirrors for imaging a mask onto a wafer is known to one skilled in the art as can be seen in the system provided by Mann et al. See pages 1-2 and 4-5. In particular, the system provided by Mann et al comprises six mirrors wherein the third mirror is a broad band multilayer mirror. See page 5. The multilayer mirror described in page 4 comprises forty alternative bilayers of Mo/Si for reflection light at 13.4 nm. While Mann et al do not clearly state that their system is used to reflect light at 13.5 nm as claimed; however, it would have been obvious to one skilled in the art to modify the system by shifting the peak reflectivity of the multilayer mirror from 13.4 nm to 13.5 nm to increase the change sensitivity by changing the thickness.

Thus, it would have been obvious to one skilled in the art at the time the invention was made to utilize the broad band multilayer mirror as provided by Yakshin et al in a system having six mirrors as provided by Mann et al for the purpose of improving the imaging of a mask onto a wafer with high quality.

11. Regarding to the claims 20-26, it is noted that the claims, in particular, the independent claim 21, is so indefinite that it is not able to make a suitable search for the device as claimed. In other words, it is unable to search for a multilayered mirror having the so-called features "the mirror comprising 36 bi-layered wherein Molybdenum has a thickness of 2.4 – 3.7 nm except for a thicker bi-layer 1 nearest substrate and Silicon has a thickness of 3.5 – 4.1 nm except for thicker bi-layers 3, 5, and 15" (claim 20, lines 7-10).

Response to Arguments

12. Applicant's arguments with respect to claims 1-26 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

13. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not

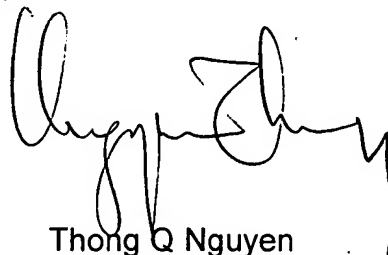
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mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thong Q. Nguyen whose telephone number is (571) 272-2316. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew A. Dunn can be reached on (571) 272-2312. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Thong Q. Nguyen
Primary Examiner
Art Unit 2872